

WHAT IS CLAIMED IS:

- 1 1. An optical inspection system for inspecting a surface under  
2 inspection, said inspection system comprising:  
3 an optical illumination system for producing a beam for  
4 illuminating a surface under inspection;  
5 a detector for measuring an intensity of said reflected  
6 light;  
7 a partially reflective surface positioned between said  
8 surface under inspection and said optical illumination system  
9 forming a resonator with said surface under inspection, whereby  
10 a signal generated by light reflected from defects on said  
11 surface under inspection that exceed a predetermined height is  
12 increased due to multiple reflections within said resonator; and  
13 a scanning system for moving said beam across said surface  
14 under inspection.

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- 1 2. The optical inspection system of Claim 1, wherein said  
2 resonator has a non-linear response with a height of said  
3 defects, whereby a signal generated by light reflected from  
4 artifacts that do not exceed said predetermined height is  
5 decreased.

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1 3. The optical inspection system of Claim 1, wherein said  
2 resonator comprises a partially reflective surface positioned  
3 substantially parallel to said surface under inspection between  
4 said optical illumination system and said device and at a tuned  
5 optical distance from said surface under inspection, whereby a  
6 signal generated by light reflected from said defects exceeding  
7 said predetermined height is increased due to multiple  
8 reflections between said partially reflective surface and said  
9 surface under inspection.

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1 4. The optical inspection system of Claim 1, wherein said  
2 partially reflective surface is a coating deposited on said  
3 surface under inspection.

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1 5. The optical inspection system of Claim 1, wherein said  
2 partially reflective surface is a surface of an optical element  
3 contained within said optical illumination system.

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1 6. The optical inspection system of Claim 5, wherein said  
2 partially reflective surface is a coating deposited on said  
3 optical element.

1 7. The optical inspection system of Claim 1, further comprising  
2 a positioner mechanically coupled to said partially reflective  
3 surface for positioning said partially reflective surface at a  
4 tuned optical distance from a region of said surface under  
5 inspection.

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1 8. The optical inspection system of Claim 7, further comprising  
2 a controller coupled to said positioner for adjusting said  
3 position of said partially reflective surface in response to a  
4 signal received from said detector.

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1 9. The optical inspection system of Claim 7, further comprising:  
2 a controller coupled to said positioner for adjusting said  
3 position of said partially reflective surface; and  
4 a processing system coupled to said controller.

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1 10. The optical inspection system of Claim 9, wherein said  
2 processing system is further coupled to an output of said  
3 detector, whereby said position is adjusted in conformity with  
4 said output of said detector.

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1 11. The optical inspection system of Claim 10, wherein said  
2 detector comprises a plurality of detectors for detecting a tilt  
3 of said surface under inspection, and wherein said processing  
4 system adjusts said position of said partially reflective  
5 surface to maintain said position of said partially reflective  
6 surface substantially parallel to a region of said surface under  
7 inspection.

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1 12. The optical inspection system of Claim 10, wherein said  
2 partially reflective surface includes a secondary tier  
3 positioned at a second tuned optical distance from said surface,  
4 and wherein said detector detects light that is transmitted  
5 through said secondary tier whereby sensitivity of said detector  
6 is improved.

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1 13. An optical inspection system for inspecting a surface under  
2 inspection, said inspection system comprising:

3 an optical illumination system for producing a beam for  
4 illuminating a surface under inspection;

5 a detector for measuring an optical signal from light  
6 reflected from said surface under inspection;

7 means for increasing an optical signal generated by light  
8 reflected from defects on said surface under inspection that  
9 exceed a predetermined height; and

10 a scanning system for moving said beam across said surface  
11 under inspection.

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13 14. The optical inspection system of Claim 13, wherein said  
14 increasing means further comprises means for decreasing an  
15 optical signal generated by light reflected from defects that do  
16 not exceed said predetermined height.

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18 15. The optical inspection system of Claim 13, further  
19 comprising second increasing means for increasing an optical  
20 signal for controlling position of said first increasing means.

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4 16. An optical inspection system for inspecting a surface under  
5 inspection, said inspection system comprising:

6 an optical illumination system for producing a beam for  
7 illuminating a surface under inspection;

8 a detector for measuring an optical signal from light  
9 reflected from said surface under inspection;

10 means for decreasing an optical signal generated by light  
11 reflected from defects on said surface under inspection that do  
12 not exceed a predetermined height; and

13 a scanning system for moving said beam across said surface  
14 under inspection.

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1 17. A method for inspecting a surface under inspection, said  
2 method comprising:

3       illuminating a partially reflective surface with an  
4 illumination beam from an illumination subsystem;  
5       illuminating said surface under inspection with a  
6 transmitted beam that is transmitted from said illumination beam  
7 through said partially reflective surface, wherein said  
8 partially reflective surface and said surface under inspection  
9 are positioned substantially parallel to each other and at a  
10 tuned optical distance such that a reflected beam reflected from  
11 defects on said surface under inspection that exceed a  
12 predetermined height has an increased signal sensitivity;  
13       positioning said beam at a location on said surface under  
14 inspection; and  
15       detecting said reflected beam from said defects.

1 18. The method of Claim 17, further comprising depositing a  
2 coating on said surface under inspection to form said partially  
3 reflective surface.

1 19. The method of Claim 17, further comprising adjusting a  
2 position of said partially reflective surface.

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1 20. The method of Claim 19, wherein said adjusting is performed  
2 in response to said detecting.

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1 21. The method of Claim 20, wherein said adjusting adjusts a  
2 tilt of said partially reflecting surface in response to said  
3 detecting having detected that a region of said surface under  
4 inspection is tilted, such that said partially reflective  
5 surface and said region are maintained in a substantially  
6 parallel arrangement.

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1 22. The method of Claim 20, wherein said detecting detects a  
2 height of a region of said surface under inspection, and wherein  
3 said adjusting adjusts a height of said partially reflective  
4 surface such that said tuned optical distance is maintained  
5 between said region and said partially reflective surface.

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23. The method of Claim 17, wherein said partially reflective  
surface includes a second tier, and wherein said detecting  
further comprises second detecting light reflected through said  
second tier and wherein said adjusting is performed in response  
5 to said second detecting.